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Solving exponential equations with different bases worksheet

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To master solving certain types of equations, let's start with a detailed lesson on how to tackle them. We'll learn from practice problems like: [25](x+1) = 625 and work our way through similar challenges by solving 10 exponential equations. For instance, we can explore 4(x+3) = 256 or 221(x-5) = 49 after following the steps to solve them. This process should be followed for six more problems like [21](x+3) = 441 or 5(5x-11) = 625 and then score your answers with a key provided at the bottom. Additionally, we'll explore solving exponential equations without a common base through problems like 5d = 22 or 11d = 23. These advanced types of equations help review all skills learned. We can also see how students perform with this skill in an informal quiz. Introducing or reviewing this skill is as simple as having your class plot how they completed the problem and how it should be done, if they fell off the path. Teaching algebra to kids can be a bit exhausting due to variables making equations difficult to understand. One of the main challenges is teaching students to solve exponential equations. If your class's kids struggle with solving exponential algebraic problems, we have methods to help you. Before diving into solving them, it's vital to understand what they are. Exponential equations refer to algebraic equations with a variable in the exponent position. To solve such problems, you need to evaluate the value of exponents, like in the equation 4 = 2x. When solving an exponential equation, see if both sides have the same base value. In cases where this is true, you can directly ignore the bases and simplify the equation by evaluating exponential values. For example, if we're solving 43y = 46, we can ignore the same base on both sides and simplify it as 3y = 6. This logic tells us that two bases with the same values on both sides of an equation are equal, so we only need to work on the exponential part. By simplifying exponents on both sides, you can evaluate the answer and test its accuracy by inputting the solution into the exponential variable. Simplifying Exponential Equations: Whole Numbers and Logs When dealing with exponential equations, you may encounter situations where one side has a whole number and the other side has an exponential expression. To simplify these algebraic equations, eliminate the exponent's base value and equate it with the whole number on the other side. For example, if you have 2y + 1 + 4 = 8, subtract 4 from both sides to get 2y + 1 = 4. To solve exponential equations with different bases, isolate the exponential values on one side and the whole number on the other. Then, apply addition or subtraction rules to simplify the equation. For instance, if you have 4y - 2 - 8 = 8, add 8 to both sides to get 4y - 1 = 16. In cases where the bases are not equal, use logarithms to combine the values. For example, given log4y - 1 = log16, apply the division rule to simplify the equation and evaluate the variable's value. To master solving exponential equations, practice with various problems that involve using logarithmic tables and balancing the equation. This process requires considering multiple factors and approaching problems strategically. Equations with Different Bases: A Guide to Solving Exponential Equations Solving exponential equations with different bases is a crucial skill for pre-calculus and algebra students. In this article, we'll explore the steps to solve these types of equations using logarithms. **Solving Exponential Equations with Logarithms** To start, you need to know how to use logarithms to eliminate the base from an exponential equation. This involves isolating the exponential part of the equation and then taking the log of each side. Here's a step-by-step guide: 1. Isolate the exponential part of the equation. 2. If there are two exponential parts, put one on each side of the equation. 3. Take the logarithm of each side of the equation. 4. Solve for the variable. 5. Check your solution graphically. **Examples** Let's work through some examples to illustrate this process: (a) 7x - 1 = 4 To solve, isolate the exponential part (in this case, 7x), take the log of each side, and then solve for x. (b) 3•2x - 2 = 13 Again, start by isolating the exponential part, taking the log of each side, and solving for x. (c) (2/3)x = 53 - x This equation requires a different approach. Start by getting rid of the fraction on the left-hand side and then proceed with the steps above. **Solving Exponential Equations without Logarithms** Sometimes, it's not convenient to rewrite each side of an exponential equation so that it has the same base. In these cases, you can use a different approach: 1. Take the log (or ln) of both sides. 2. Apply the power property. 3. Solve for the variable. **Examples** Let's work through some examples using this approach: (a) 6x = 42 Start by taking the log of each side, applying the power property, and solving for x. (b) 7x = 20 Again, start by taking the log of each side, applying the power property, and solving for x. (c) 82x - 5 = 5x + 1 This equation requires a different approach. Start by getting rid of the constant term on the left-hand side and then proceed with the steps above. **Solving Exponential Equations with Different Bases** When dealing with exponential equations that have different bases, you can use the change of base formula to solve them: 1. Write the equation as a log equation. 2. Use the change of base formula to rewrite the equation. 3. Solve for the variable. **Examples** Let's work through some examples using this approach: (a) 5x = 476 Start by writing the equation as a log equation, applying the change of base formula, and solving for x. (b) 4•3x = 984 Again, start by writing the equation as a log equation, applying the change of base formula, and solving for x. **Solving Exponential and Logarithmic Equations** Sometimes, you'll encounter equations that involve both exponential and logarithmic functions. In these cases, you can use the following principle: logaag(x) = g(x) This allows you to solve these types of equations by combining like terms and solving for x. **Examples** Let's work through some examples using this approach: (a) 88x + 7 = 9 Start by combining like terms and then solving for x. (b) 61 - 2x = 3 Again, start by combining like terms and then solving for x. (c) log24x + log2x = 2 This equation requires a different approach. Start by combining the logarithmic functions and then solving for x. **Solving Exponential Equations That Are Not One-to-One** Finally, let's consider exponential equations that are not one-to-one. These equations require a slightly different approach: 1. Isolate the exponential part of the equation. 2. Take the log of each side. 3. Solve for the variable. **Examples** Let's work through some examples using this approach: (a) 34x - 5 = 17 Start by isolating the exponential part, taking the log of each side, and solving for x. Try the free Mathway calculator and problem solver below to practice various math topics.